NOTES ON THE NATURAL HISTORY OF BUCHANAN'S SNAKE-EYED SKINK *CRYPTOBLEPHARUS BUCHANANII* IN ARID WESTERN AUSTRALIA

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ABSTRACT

Ecological data on Buchanan's Snake-eyed Skink, *Cryptoblepharus buchananii* in arid Western Australia are presented. Ambient air temperature averages 25.95°C and active body temperature averages 32.63°C in these small arboreal diurnal skink species. Mean time of activity is 10.8 hours. Most lizards are found in the litter under Marble Gum trees or above ground on tree trunks but some were pit trapped in litter on the ground. These lizards are generalized predators that consume a wide range of insects, especially termites, small spiders, beetles and true bugs. Mating occurs during the Spring, eggs are laid in October–November, clutch sizes always consist of 2 eggs and relative clutch mass averaged 0.219 (clutch volume/fresh female body weight). Fat bodies undergo a seasonal cycle.

INTRODUCTION

Buchanan's Snake-eyed Skink, *Crytoblepharus buchananii* is a wide-ranging small skink, found in mid and southern Western Australia, from the Pilbara region to much of southern Western Australia (Horner 2007). Members of this wide-ranging genus of small skinks are also found in much of Australia except for the southeast (Cogger 1992; Horner 2007). In many parts of Australia different species have overlapping distributions especially in the tropical far north of Australia including the Cape York Peninsula. *Cryptoblepharus buchananii* is a familiar denizen of garden walls in Perth, these lizards are usually found on trees in the outback. *Cryptoblepharus buchananii* occurs at Eric R. Pianka's (ERP) two easternmost Western Australian study areas at 27 km. S. Atley Homestead and on the L-area 40 km. E. Laverton. Deeper in the Great Victoria Desert (GVD), it is apparently replaced by another species *C. australis* (Horner 2007). Two specimens of the closely related *C. australis* were found

well into the Great Victoria Desert (GVD) at the G-area 27 km. S. Neale Junction. Table 1 gives the years and dates when lizards were collected along with the latitude and longitude of each study site.

Taxonomic note: At the time of collection of specimens reported on in this paper this species was known as *Cryptoblepharus plagiocephalus* and was recorded as distributed over most of Australia. However a molecular systematic assessment of species boundaries in the genus by Horner and Adams (2007) has revealed a number of unnamed taxa which resulted in the generic revision by Horner (2007). This revision also separated *C. buchananii* from *C. plagiocephalus* which is distributed from the Eastern Goldfields of Western Australia to the Pilbara region and overlaps much of the range of *C. buchananii* in arid Western Australia (Horner 2007).

METHODS

Most lizards were collected during Springs in the Great Victoria Desert (GVD) of Western Australia. Field work took place over six separate expeditions, commencing in November 1966 and ending in December 1992 (Table 1). A total of 292 days were spent collecting: 34 days at Atley, 16 days on the G-area, and 242 days at the L-area.

Up until 1979, all specimens were collected by hand, and data were obtained on date and time of activity, ambient air temperature, active body temperature, habitat and microhabitat. Active body temperatures were measured immediately after capture with Shultheiss thin bulb cloacal thermometers. Air temperatures were taken at the same time in the shade at chest height. All times of activity were decimalized to facilitate computation of statistics. Beginning in 1989, most specimens were collected using pit traps (7,420 pit trap days), which provided more limited, qualitatively different information. Pit-trapped specimens provided no data on microhabitat, thermal relations, or time of activity, but were useful for analyses of diet and reproduction.

Items within stomachs were sorted among 21 categories, mostly arthropod orders. Prey items were counted and volumes estimated to the nearest cubic millimetre for each category. Volumes were estimated by placing a one millimetre thick layer of material over square millimetre grid paper and approximating total volume. Each lizard's counted stomach contents were kept individually and stored in ethanol. Dietary niche breadths were estimated using the inverse of Simpson's (1949) index of diversity [$D = 1/ \Sigma p_i^2$] where p_i is the proportion by volume of food items in stomachs based on 21 prey categories.

All specimens were collected with permits from appropriate authorities and animal ethics committees, and all were deposited either in the Los Angeles County Museum of Natural History, the Western Australian

Table 1. Dates spent at 3 desert study sites with *Cryptoblepharus buchananii* and *C. australis*.

Cryptoblepharus buchananii: A-area, 27 km S. Atley Homestead (Lat. 28° 27' S, Long. 119° 05' E).

Year:	Dates
1966:	27–29 Nov., 5–8 Dec., 15–18 Dec.
1967:	29–31 Jan., 1–4 Feb., 18–20 Feb., 19–22 Oct., 28 Oct., 18–20 Nov., 29–31 Dec.
1968:	8–9 Jan

C. buchananii: L-area 40 km. E. Laverton (Lat. 28° 31' S, Long. 122° 45' E), Great Victoria Desert.

Year:	Dates
1967:	21–28 Feb., 1 March, 14 May, 30–31 Aug., 17–19 Sept., 3 Oct., 21 Nov.
1978:	21–22 Aug., 24 Aug., 14–17 Oct., 25–28 Oct., 6–14 Nov., 21 Nov., 27–30 Nov., 1–2 Dec., 15–18 Dec., 25–28 Dec.
1979:	7–13 Jan., 21–22 Jan., 25–26 Jan., 5–18 Feb., 21–28 Feb., 1–3 March, 14 March
1989:	1–6 Oct., 18–21 Oct., 28 Oct., 4 Nov., 12–20 Nov., 2–7, 15–17 Dec., 29–31 Dec.
1990:	1–2 Jan., 14–17 Jan., 27 Jan.–8 Feb., 24 Feb.–4 March, 1–6 Sept., 18–23 Sept., 4–10 Oct., 19–26 Oct., 2–6 Nov., 22–27 Nov., 8–13 Dec., 22–30 Dec.
1991:	9–15 Jan., 24–28 Jan., 17–20 Feb.
1992:	21–29 July, 18–22 Oct., 9–13 Nov., 16–22 Nov., 16–20 Dec.

C. australis: G-area, 27 km. S. Neale Junction (Lat. 28° 30' S, Long. 125° 50' E), Great Victoria Desert.

Year:	Dates
1967:	13–19 Jan., 28–30 Sept., 1 Oct., 25–29 Nov.

Museum, or The Texas Natural History Museum. Here, we report augmented ecological information on the skink *Cryptoblepharus buchananii*, mostly from Eric R. Pianka's L-area study site (Pianka 1986).

RESULTS

Temperature Relationships and Time of Activity

Ambient air temperatures of active lizards ranged from 16.9°C to 37.5°C and averaged 25.95°C (N=112). Active body temperatures ranged from 25.2°C to 38.4°C and averaged 32.63 (N=98). Figure 1 plots active body temperature against ambient air temperature. The slope of a regression of active body temperature on ambient air temperature is 0.383, an indication of moderate degree of thermoregulation (Huey and Slatkin 1976). Time of activity ranged from 6.9 to 17.4 hours and averaged 10.81 (N=116).

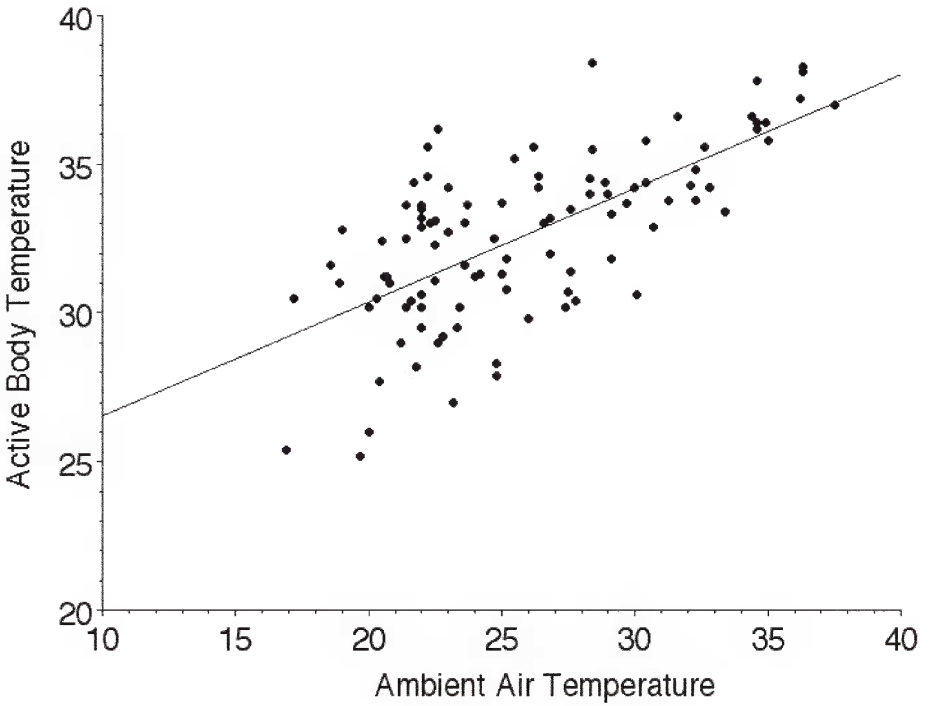

Figure 1. Active body temperature of *Cryptoblepharus buchananii* plotted against ambient air temperature.

Microhabitats

Most lizards in this study were found in the litter under Marble Gum (*Eucalyptus gonglyocarpa*) trees or on tree trunks. Each lizard captured was allocated to one of the eleven microhabitat groupings recorded in the study sites. High sun, low sun, high shade, tree shade and tree sun were the most frequent microhabitats recorded for active lizards (Table 2).

Size, Tail Length, and Weight

Although females are, on average, slightly larger and heavier than males, no statistically significant sexual dimorphism is discernable. Snout-vent length (SVL) in mm ranges from 22 to 48, averaging 39.69 (N=165). Length of intact (non-regenerated) tails ranges from 28 to 91, average = 53.88, N=84). Body weight in grams ranges from 0.1 to 1.7 (average = 0.98, N = 163).

Diets

Cryptoblepharus buchananii are dietary generalists and their most important prey are termites, small spiders, beetles and true bugs (Table 3).

Reproduction

In a study of lizard reproduction in the tropics, James and Shine

Table 2. Numbers and proportion of *Cryptoblepharus buchananii* found in various microhabitats. Specimens found at an interface between habitats are split between both. Microhabitat niche breadth is 5.72, calculated as the inverse of Simpson's (1949) index of diversity, $1/\Sigma p_i^2$ where p_i represents the proportion of animals in microhabitat *i*.

Microhabitat	Number of Lizards	Proportion of Lizards
Open Sun	4	0.027
Grass Sun	1	0.007
Tree Sun	12	0.093
Other Sun	5.5	0.037
Open Shade	1	0.007
Tree Shade	14.5	0.096
Other Shade	1.5	0.010
Low Sun	35	0.233
Low Shade	9.5	0.063
High Sun	39.5	0.263
High Shade	25	0.166
Total, Microhabitat Niche Breadth	**151**	**5.72**

Table 3. Summary of stomach contents of *Cryptoblepharus buchananii* based on 21 different prey categories. Total number and volume of prey items as well as proportions are given. Frequencies of occurrence of various prey types are percentages based on 161 lizards.

Prey type	Total Number	Total Volume	Proportion by Number	Proportion by Volume	Frequency
Aranae	55	0.731	0.135	0.158	46
Pseudoscorpionida	2	0.012	0.005	0.003	2
Ants	17	0.182	0.042	0.039	14
Wasps	18	0.31	0.044	0.067	11
Orthoptera	13	0.39	0.032	0.084	12
Thysanura	7	0.064	0.017	0.014	6
Blattaria	7	0.2	0.017	0.043	7
Phasmids/Mantids	1	0.02	0.002	0.004	1
Coleoptera	39	0.476	0.096	0.103	32
Isoptera	120	0.508	0.295	0.110	22
Hemiptera	31	0.497	0.076	0.107	24
Dermaptera	2	0.038	0.005	0.008	2
Diptera	16	0.209	0.039	0.045	10
Lepidoptera	16	0.11	0.039	0.024	9
Eggs	3	0.01	0.007	0.002	2
Larvae	20	0.245	0.049	0.053	13
Pupae	1	0.01	0.003	0.002	1
Other Insects	13	0.1	0.017	0.022	13
Vertebrate	5	0.066	0.012	0.014	5
Other Unidentified	29	0.449	0.066	0.097	29
Total	**407**	**4.636**			

(1985,1988) reported data on reproduction of another *Cryptoblepharus* species (now = *C. cygnatus* according to Horner 2007) at Jabiru in tropical Northern Territory; lizards, especially males, were reproductive at most times of the year, clutch size was 1–2 eggs (mean = 1.9, N=51) and average relative clutch mass was 18% (range 8.8–25%), which was correlated with female SVL (r = 0.866). On the arid temperate zone sites studied here, *C. buchananii* testes were enlarged from September through January, suggesting that mating takes place during the Spring. Gravid females with eggs in their oviducts were found in September (N=1), October (N=5), November (N-1), December (N=3), and January (N=3). Average SVL of females with eggs in their oviducts was 42.4 mm (N = 12). All gravid females contained 2 oviductal eggs, clutch volume as a fraction of female body weight (relative clutch mass, RCM) ranged from 0.143 to 0.292 (mean RCM 0.219, N = 9).

Fat Bodies

Fat bodies of *C. buchananii* undergo a seasonal cycle (Figure 2), but were smaller in females than in males during the Spring breeding season from October–December [Females vs. Males: means + standard errors: 4.438 ± .683 mm (N=16) vs. 7.625 ± .737 mm (N=16)], probably an indication that females must mobilize fat reserves in order to yolk up egg follicles.

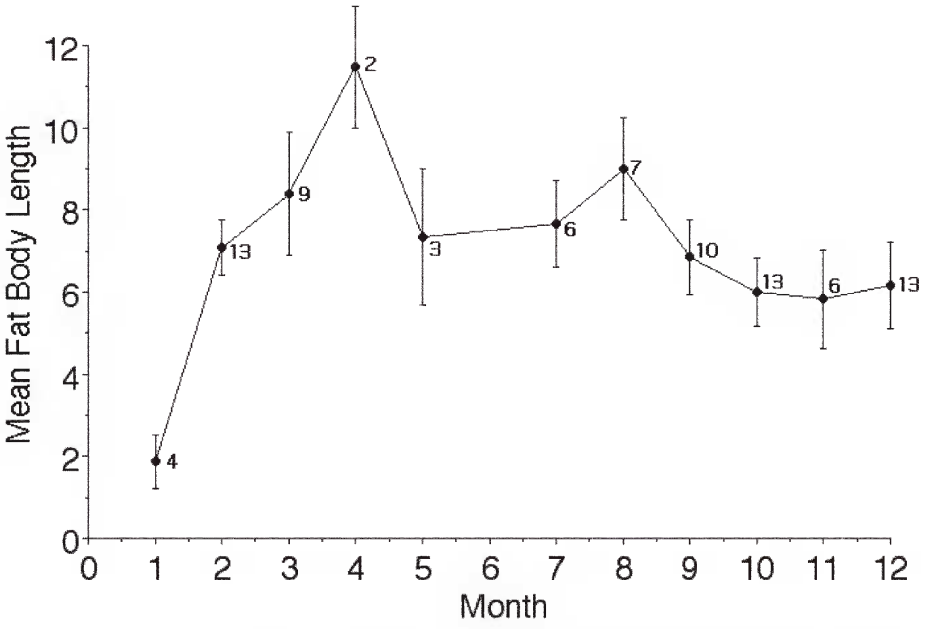

Figure 2. Average summed length in mm of fat bodies (both sexes combined) by months.

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